

CLAIMS

1. A resonance frequency detecting device of a multi-shaft electric motor control apparatus comprising an electric motor control system provided with each of a plurality of shaft of
5 a machine, the electric motor control system having:

an electric motor for driving one of the plurality of shafts of a machine; and

a controller for driving the electric motor upon receipt of a control command for each of the shafts,

10 wherein the electric motor control system includes:

a detector for detecting an operating amount of the machine;

a signal processor for analyzing a frequency of a signal of the detector and outputting the frequency as a resonance
15 frequency; and

an output device for changing a signal of the signal processor into a graph or a numeric value to be output,

characterized in that at least one command generator for giving the control command for transmitting a vibration to the
20 machine to at least one of the electric motor control systems is provided to input signals of the detectors to the signal processors and to output them as resonance frequencies.

2. The resonance frequency detecting device of a multi-shaft
25 electric motor control apparatus according to claim 1, wherein

the signal processor inputs the signals of the detectors and outputs a sum of the signals as a resonance frequency.

3. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 or 2, wherein the detector detects a position or speed of the electric motor, or a position or speed of a movable portion of the machine.

10 4. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 3, wherein in the case in which a part or all of the electric motor control systems is an open loop, a signal of the command generator is input to the controller of the electric motor control system of the open loop.

5. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 3, further comprising:

20 a closed loop controller for giving the controller a control command corresponding to a deviation between a control command sent from the command generator and the operating amount of the machine which is sent from the detector in a part or all of the electric motor control systems.

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6. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 3, further comprising:

a closed loop controller for outputting a control command
5 corresponding to a deviation between the operating amount of the machine which is sent from the detector and an operation command; and

a filter processing portion for reducing a signal in a predetermined band included in the control command in a part
10 or all of the electric motor control systems,

wherein a sum of an output of the filter processing portion and a command signal sent from the command generator are input to the controller.

15 7. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 6, wherein the control command is a sweep sine wave signal, and

the signal processor inputs a frequency information of
20 the sweep sine wave signal output from the command generator and a signal of at least one of the detectors, and outputs a frequency of the sine wave signal at which an absolute value of the signal of the detector is maximized as a resonance frequency.

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8. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 7, wherein the output device outputs a signal of at least one of the signal processors as a frequency characteristic.

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9. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 8, wherein a control command for transmitting a vibration from the command generator to a machine has a frequency limited to a range from a minimum frequency F_{min} to a maximum frequency F_{max} , and

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the signal processor limits a signal of the detector to a predetermined frequency range and inputs the signal, and detects only a frequency which is equal to or higher than the minimum frequency F_{min} .

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10. The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to any of claims 1 to 8, wherein a control command for transmitting a vibration from the command generator to the machine has a frequency limited to a range from a minimum frequency F_{min} to a maximum frequency F_{max} , and

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the signal processor limits a signal of the detector to a predetermined frequency range and inputs the signal, and detects only a frequency which is higher than the minimum

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frequency F_{min} and is equal to or higher than a detected minimum frequency F_{lim} .

11. The resonance frequency detecting device of a multi-shaft
5 electric motor control apparatus according to any of claims
1 to 10, wherein a high-pass filter is provided between the
detector and the signal processor.

12. The resonance frequency detecting device of a multi-shaft
10 electric motor control apparatus according to any of claims
1 to 11, wherein a switch for inputting a signal of the detector
for one of the shafts to signal processors for another shaft
is provided.